Smart Grid

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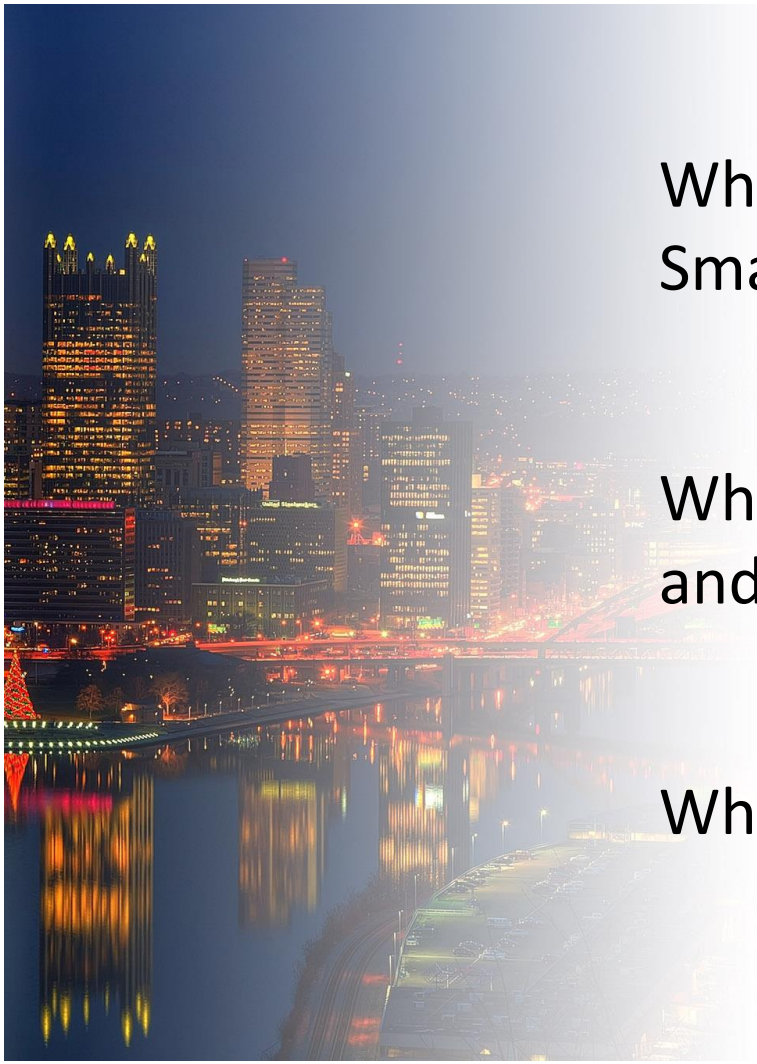
What we will cover

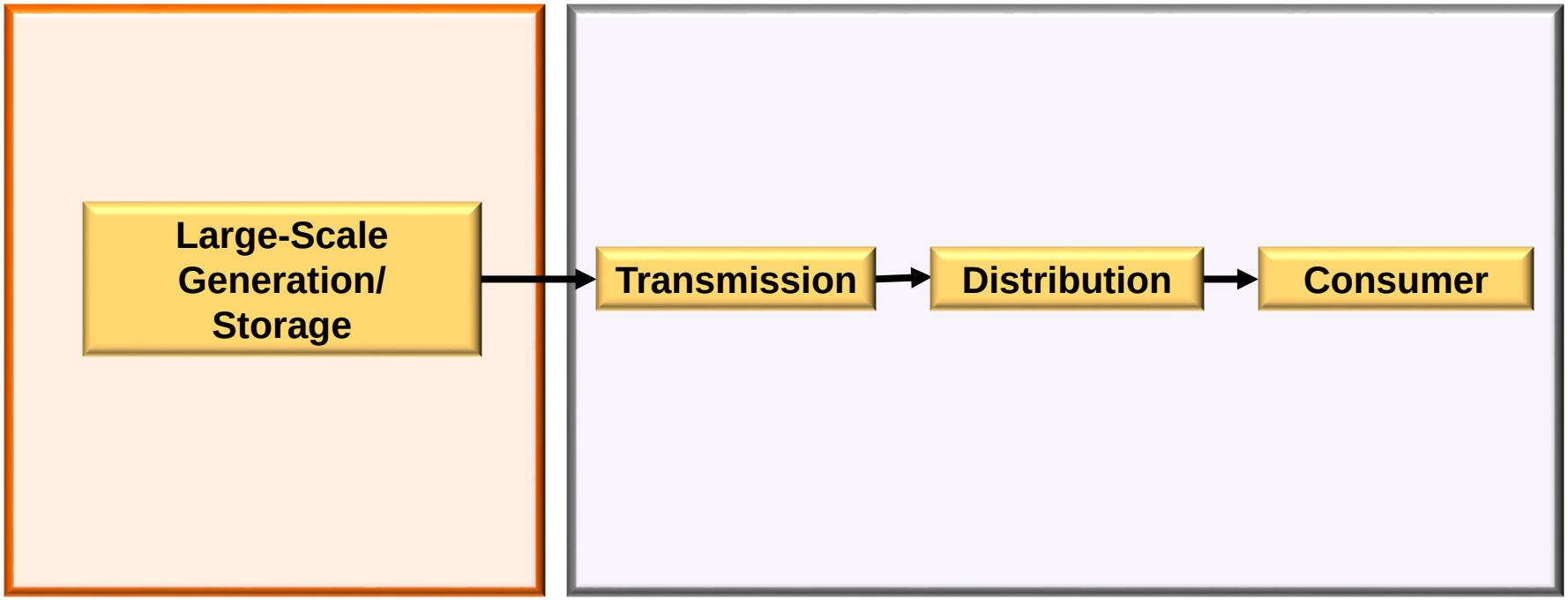


What's the difference between a Smart Grid and a modern grid?

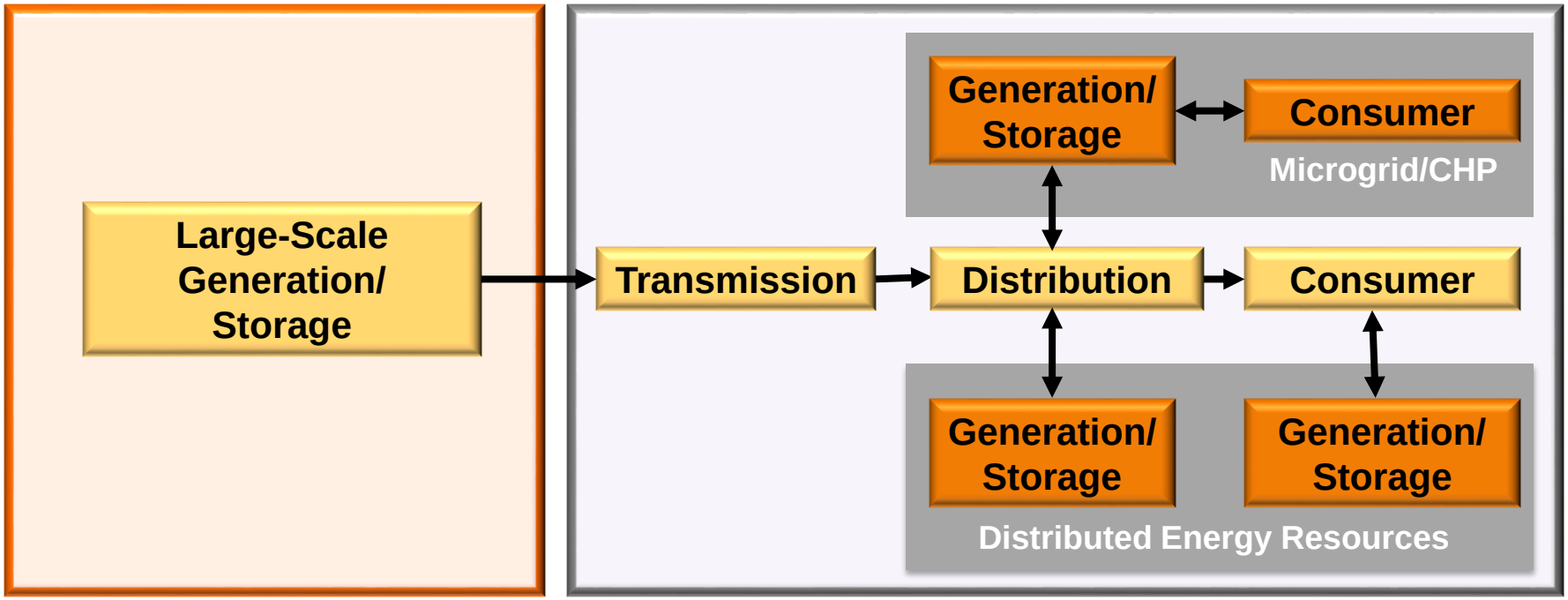
What are the technologies, benefits, and metrics?

What are the challenges?

Basic structure of electric power systems today



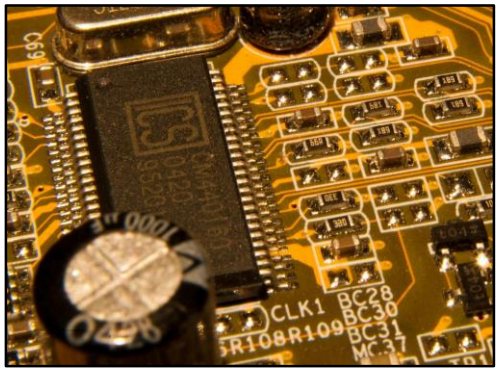
The modern system will have changes in all of these elements, some more than others



The Smart Grid will…

1. Enable active participation by consumers
2. Accommodate all generation and storage options
3. Enable new products, services, and markets
4. Provide power quality for the digital economy
5. Optimize asset utilization and operate efficiently
6. Anticipate & respond to system disturbances (self-heal)
7. Operate resiliently against attack and natural disaster

The Modern Grid includes Smart Grid enhancements and more



Attributes of Smart Grid

Senses
Protects
Controls

Enhanced Functionality

Generation
Storage
Load

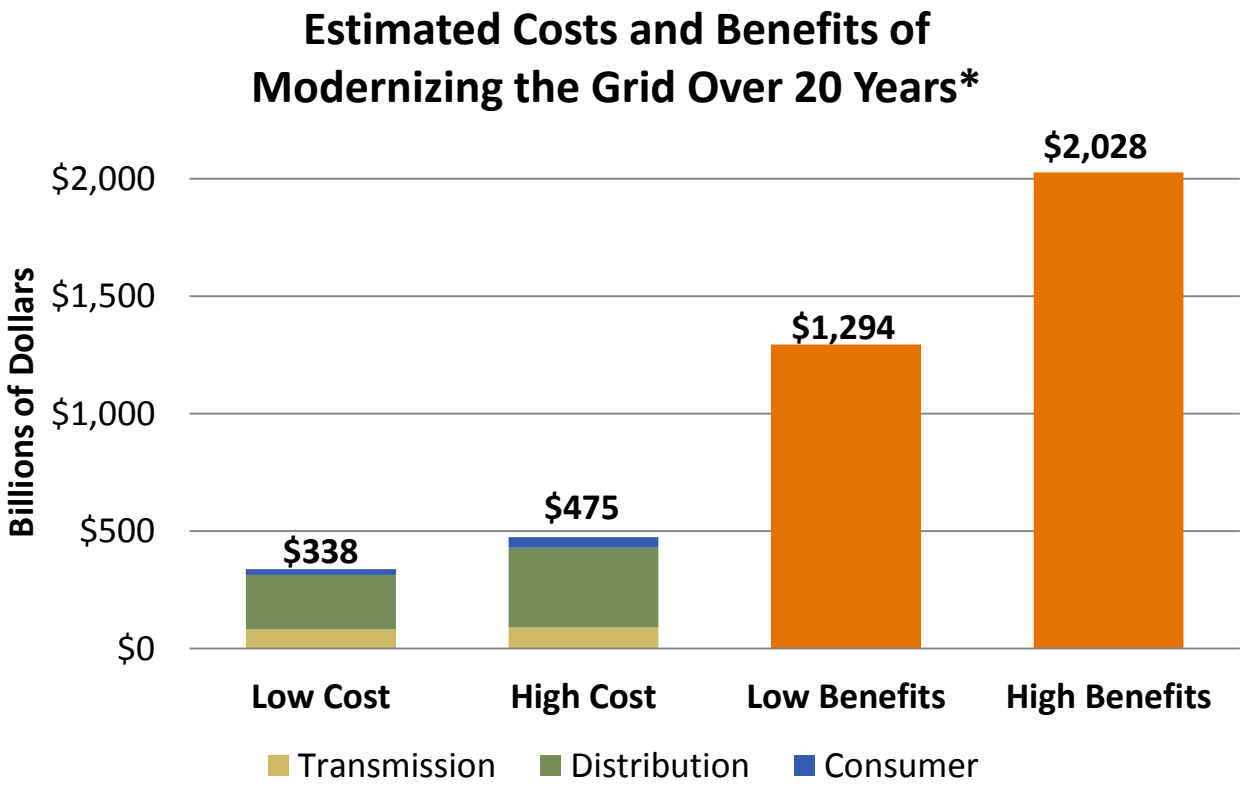
Modern Grid

Communication

A Smart Grid allows for a number of significant changes

Passive consumers	Active consumers
One-way flow of power and comm.	Two-way flow of power and communication
Central generation	Flexible mix of central and distributed
Passive asset control	Active asset control
Radial system	Networked and integrated system
Fixed rates	**Dynamic pricing**
Separate transmission & distribution	**Interactive transmission & distribution**
Few ties to other infrastructures	**Potential to transform transportation sector**

There is a significant cost to modernizing the grid but estimates suggest the benefits outweigh the costs



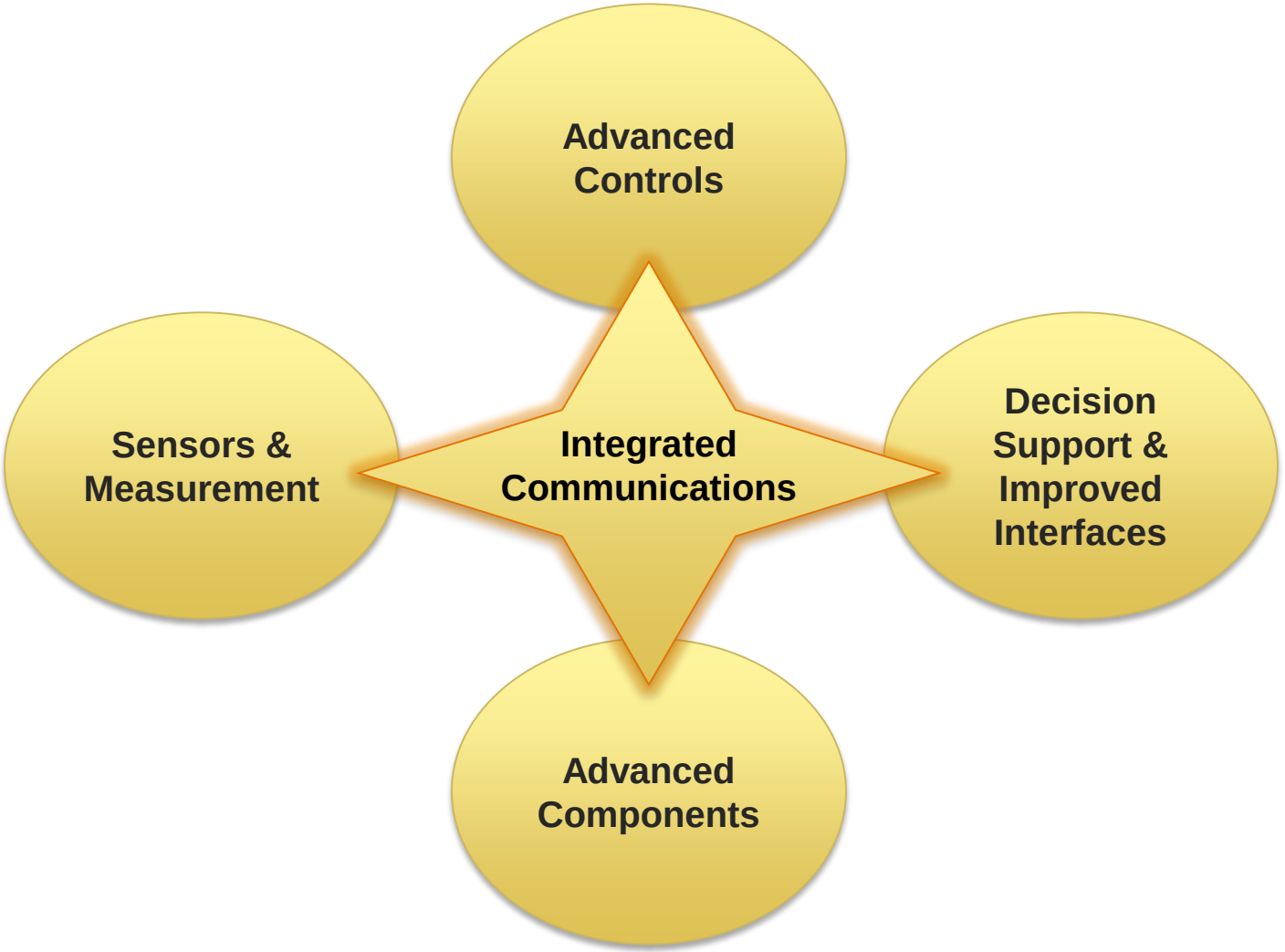
*Per year cost:
$17 billion to $24 billion

Overall benefit-to-cost ratio of 2.8 to 6.0

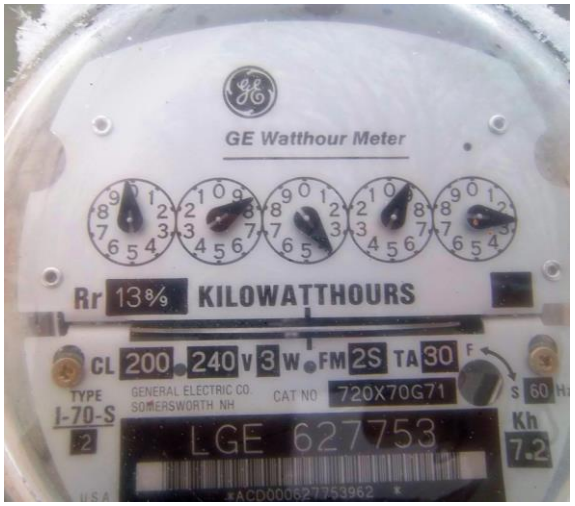
Sources: EPRI, 2011 and EPRI Report: http://www.smartgridinformation.info/pdf/3272_doc_1.pdf

Technologies, Benefits, and Metrics

Smart Grid technologies fall into five basic categories



The benefits of a Smart Grid can vary for different groups



Utilities

What's in it for my **shareholders**?

Consumers

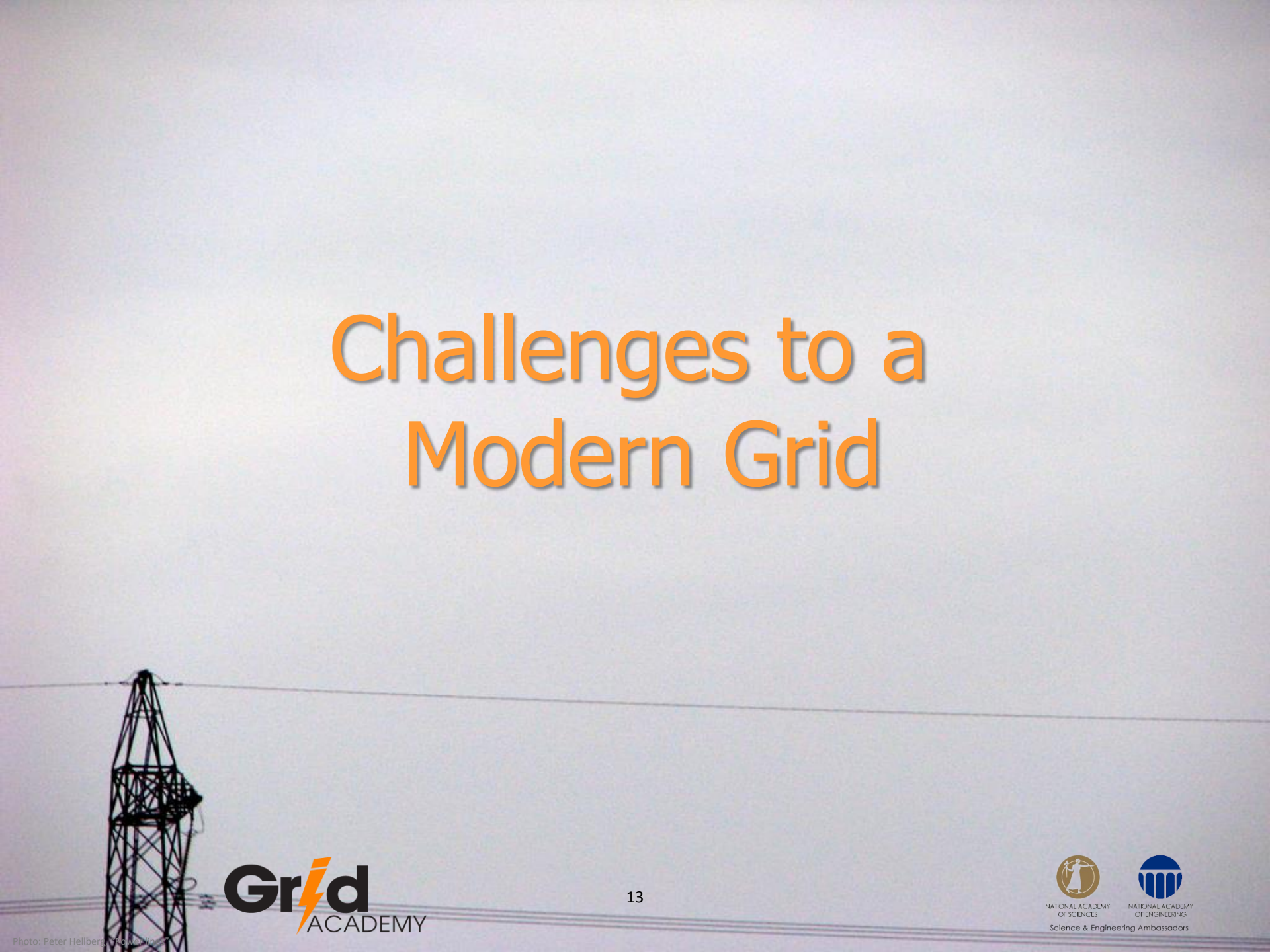
What's in it for **me**?

Society

What's in it for **us**?

The Smart Grid should have quantifiable measurements of performance

Challenges to a Modern Grid



Top **technical** challenges to a modern grid

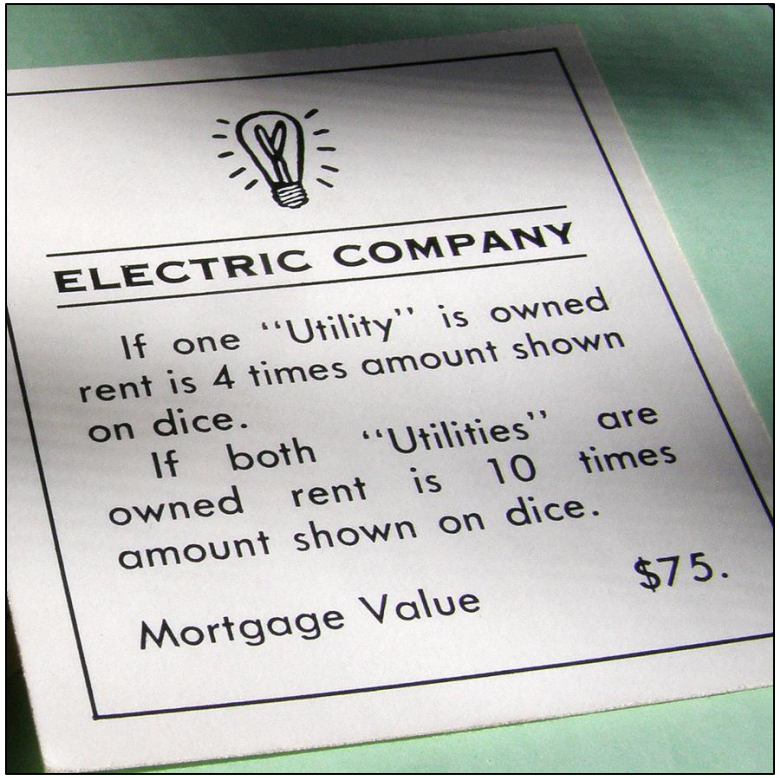
Two-way communications

Data management

Integration of legacy equipment

Interoperability and cyber security standards

Top **regulatory** issues facing a modern grid

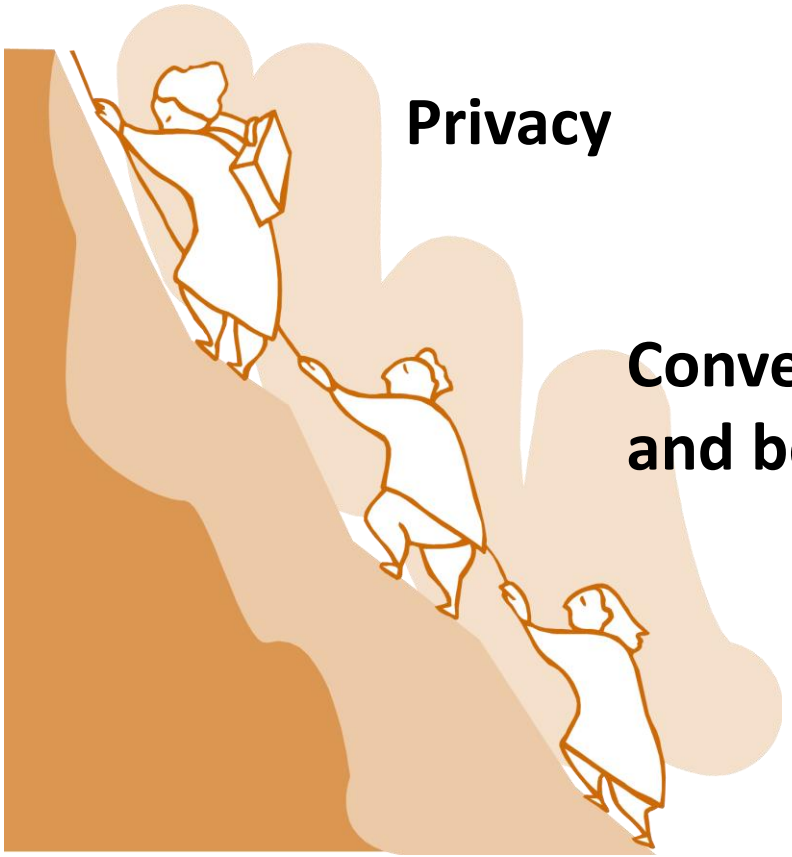


Used and useful & least cost

Recovery of investment cost

Dynamic pricing

Customers' concerns



Privacy

Convenience, comfort, and benefits

Understanding

SMART

is the alternative to

BIG.